



Porcelain veneers – part II: preparation and delivery

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Introduction

Porcelain Veneers Part I, July 2003, reviewed the evaluation and treatment planning phases of porcelain veneer restorations. Part II will address clinical techniques used in tooth preparation, delivery, and the post-operative phases of treatment.

Traditional preparation design

Traditional veneer preparation is a conservative reduction of tooth structure consisting of 0.5mm facial reduction with interproximal finish lines facial to the contact area. Because all prepared surfaces are generally in enamel and contacts are left undisturbed, the need for temporization is minimized and the potential for pulpal involvement is significantly reduced. Supragingival veneer margins avoid the risk of irritation to periodontal tissues (1).

Preparation Procedure:

1. Retract gingival tissue if necessary.
2. Make a series of facial depth cuts by either using round carbide burs, or Brasseler™ or Nixon™ depth cutters. Reduction of 0.5 mm is usually adequate and should follow the anatomic contours of the teeth.
3. Place a “long chamfer” margin with an obtuse cavosurface angle, which exposes the enamel prism ends at the margin for better etching. The margin should closely follow the gingival crest.
4. Place the preparation margin labial to the proximal contact area to preserve it in enamel.
5. Do not reduce the incisal edge if possible; this helps support the porcelain and makes chipping less likely. If the incisal length is to be increased, the tooth should be reduced to allow for a minimum of 1.5mm of porcelain.
6. Avoid undercuts and visualize the path of insertion because an undercut will prevent placement of the veneer.
7. Connect depth cuts and margins. To prevent areas of stress concentration in the porcelain, ensure the tooth preparation is free of sharp angles. All prepared surfaces should be rounded and smoothly flowing.

Alternate preparation designs

- Ultraconservative preparation design is more conservative than the traditional veneer preparation, which can result in dentin exposure in the cervical areas. This preparation design advocates cervical reduction of 0.3mm and midfacial reduction of 0.3mm to 0.5mm, which takes into account the mean thickness of enamel (2).
- Extending traditional veneer preparation is appropriate for situations requiring hidden margins, or increased retention. In this design, proximal margins are extended into or through the contacts and the gingival margins are placed slightly subgingival. It is indicated for malaligned teeth, discoloration, black space closure, veneers adjacent to crowns, replacing restoration or wrapping an existing restoration, and diastema closure (1).

In preparing diastema closure, the interproximal preparation is extended through the contact toward the lingual. The greater the space to be closed, the farther the preparation must be carried to the lingual. It is also important to extend the interproximal preparation subgingivally to recontour the papilla. This type of preparation must be provisionalized to reduce sensitivity and prevent migration (1).

Material options

- Feldspathic porcelain. Traditionally, ceramic veneers are fabricated by layering feldspathic porcelain onto a refractory die or platinum foil (3).
- Densely sintered high-purity magnesium oxide base coping, e.g. In-Ceram Spinell. The core is more translucent than the traditional In-Ceram but does not possess the same flexure strength. It can be veneered with feldspathic porcelain but is not necessary.
- Heat-pressed ceramic material, e.g. IPS Empress. Leucite-reinforced feldspathic porcelain has improved flexural strength, fracture resistance, and excellent marginal adaptation. It can also be veneered with feldspathic porcelain.

Veneer delivery procedures

Preliminary inspection

- Examine veneers under magnification.
- Check fit of veneers on dies by first trying veneers one-at-a-time and then all together.
- Clean the restorations thoroughly in water with ultrasonic agitation.

Tooth Preparation

- Thoroughly clean the preparations, making sure all provisional luting agents are removed.
- Try-in restorations with water, first one-at-a-time and then all together. Verify fit, shade, and insertion sequence.

Color Check and Characterization

- Place one laminate in position with water or glycerine and then compare it to the shade tab selected. If the laminate appears dark, then a lighter colored resin cement should be selected. Utilize color-keyed try-in pastes to evaluate and select the appropriate shade (4).
- Veneers can also be characterized externally using a special laminate low-fusing color system, which fuses at approximately 1,400°F. The laminate can also be supported with an instant investment, which when set facilitates coloring and glazing with any conventional system (4).

Cementation

- Use rubber dam isolation or displacement cord, cotton rolls, and cheek retractors.
- Clean the teeth with pumice. Wash and dry.

- Check with the dental laboratory to see if the fabricated veneers were etched. If not, etch the internal surface of the veneer with hydrofluoric acid for 5 minutes. Rinse and dry.
- Silane is painted onto the etched porcelain to enhance the adhesive properties of the resin. Allow to dry for one minute and gently air-dry the veneer surface (4, 5).
- Place a Mylar matrix strip, dead soft metal matrix, or plumber's teflon tape interproximally to protect adjacent teeth.
- Etch the enamel with 37% phosphoric acid for 30 seconds. Rinse thoroughly and dry.
- Following the manufacturer's instructions for cementing veneers, apply bonding agent to etched enamel and etched, silanated veneer surface but do not light cure.
- Apply light cure composite resin luting agent to the restoration. Be careful to avoid trapping air.
- Position the restoration gently, seating veneer from incisal to gingival. Remove excess luting agent with an instrument.
- Hold the restoration in place while light-curing the resin. Do not press on the center of veneers; they may flex and break.
- Remove excess cement before full cure being careful not to pull cement out from veneer margin leaving a defect.
- Light cure for 40 seconds from several directions for 2-3 minutes cumulative cure time per veneer.

Finishing

- Remove resin flash with a scalpel or sharp curette.
 - It is important to realize that the unsupported porcelain veneer should never be contoured until bonding is completed.
 - Finish accessible margins and occlusion with fine diamonds, using water spray. Use finishing strips for the interproximal margins.
 - Polish adjusted areas with an intra-oral porcelain polishing system (rubber wheels or points, diamond polishing paste, etc.)
- Caution: for pressable systems, e.g. Empress, the color is on the surface and can be polished away.**

Seating sequence in multi-unit case

Start with the two central incisors. It is essential that the veneers of the central incisors be positioned correctly. The two lateral incisors are then seated, one at a time, to accommodate any discrepancies in overall fit (4). There are numerous opinions about the cementation sequence of the remaining veneers. Minor adjustments made on posterior teeth can be accomplished without jeopardizing esthetics.

Factors influencing veneer failure

- Adhesion of the veneer seems to be the most important factor to reduce the compressive and tensile stresses in the veneer. Contamination during bonding significantly decreases the bond strength of the porcelain veneers.
- Higher porcelain veneer failure rates have been observed when the gingival margin is located on dentin. Today's dentin bonding agents are improved over previous generations but no long-term data exist indicating the expected longevity of bonded dentin margins (6). Ideally all veneer margins should be on enamel. When cervical margins must be on dentin, utilize highly filled, viscous resin cements and dentin bonding agents of the latest generation to achieve greatest longevity (6).
- Patients who smoke increase their risk of veneer failure due to staining at the veneer margins (6).
- There is an increase in gingival recession in 31% of the patients, which ranged from 0.1 to 0.5mm. 88% of the recession is localized in teeth where the margin is subgingival.

There is also an increase in papillary bleeding on probing in 25% of restored teeth with subgingival restoration margins (7).

- Subgingivally placed margins of dental restorations are associated with pathologic alteration of the adjacent gingiva; the greater the marginal inaccuracy of the restoration, the greater the permanent damage to the periodontal tissue (7).

Maintenance

- Resin polymerization takes at least 72 hours to complete. During this early phase, hard and extremely hot or cold food, alcohol and medicated mouthwashes should be avoided. (4)
- Patients will have a period of adjustment for the first two weeks as they get used to the "new" teeth that changed in size and shape.
- Patients should be instructed to use a soft toothbrush with rounded bristles, and to floss daily.
- Patients should also avoid biting on hard objects/food with restored teeth.
- Routine cleanings are recommended at least every four months with a hygienist. Ultrasonic scalers and air abrasion systems should be avoided.
- A hard night guard is useful to decrease the potential for fracture of the laminate and excessive wear of the opposing arch. A soft acrylic mouth guard should be used for any form of contact sports.

References

1. Rouse JS. Full veneer versus traditional veneer preparation: a discussion of interproximal extension. J Prosthet Dent. 1997 Dec; 78(6): 545-9.
2. Rouse J, McGowan S. Restoration of the anterior maxilla with ultraconservative veneers: clinical and laboratory considerations. Pract Periodontics Aesthet Dent. 1999 Apr;11(3):333-9.
3. Zhang F, Heydecke G, Razzoog ME. Double-layer porcelain veneers: effect of layering on resulting veneer color. J Prosthet Dent. 2000 Oct;84(4):425-31.
4. Garber DA, Goldstein RE, Feinman RA. Porcelain Laminate Veneers. Quintessence Publishing Co. 1988: 90-98.
5. Kamada K, Yoshida K, Atsuta M. Effect of ceramic surface treatments on the bond of four resin luting agents to a ceramic material. J Prosthet Dent. 1998 May;79(5):508-13.
6. Dumfahrt H, Schaffer H. Porcelain laminate veneers. A retrospective evaluation after 1 to 10 years of service: Part II-Clinical results. Int J Prosthodont. 2000 Jan-Feb;13(1):9-18.
7. Christgau M, Friedl KH, Schmalz G, Resch U. Marginal adaptation of heat-pressed glass-ceramic veneers to dentin in vitro. Oper Dent. 1999 May-Jun;24(3):137-46.

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